REMARKS

In the Official Action Dated May 12, 2009, the Examiner rejected the pending claims as obvious in view of U.S. Pat. No. 1,774,662 to Parks in view of several additional U.S. patents. Applicant requests that the Examiner reconsider the rejection in light of the following discussion.

Initially, Applicant notes that the Examiner rejected claims 1-10 as indefinite. Although Applicant believes the claims were clear and definite as required by 35 U.S.C. §112, Applicant have made the minor changes to provide explicit antecedent basis as indicated by the Examiner. Applicant notes that with respect to claim 7, the Examiner indicated that claim 7 is indefinite because it refers to shaft speed, but no shaft has been recited. Applicant notes that claim 7 indirectly depends from claim 3, which recites a shaft. Accordingly, Applicant requests that the Examiner reconsider the objection in paragraph 12 of the Official Action.

Applicant has also amended Fig. 1 to illustrate a second working chamber as recited in claim 1. The second working chamber is similar to working chamber 4 and associated valve 1 and other elements disclosed in the specification. Since the application as initially filed disclosed the plurality of working chambers, the replacement figure does not add any new matter.

Referring now to the prior art rejections, the Examiner cites Park '662 as the primary reference. However, the Examiner recognizes that Park does not teach a valve in the flow path. To overcome this shortcoming in the teaching of Park '662, the Examiner contends that it would be obvious to put valves of Salters 5,259,738 "in the flow path as taught by Jokela [5,456,581]". However, the function of the solenoid valve is not the same as that of Salter's valve, and Jokela does not teach a series arrangement of multiple flow switching devices between a manifold and a working chamber.

In a fluid working machine, a commutation mechanism is needed to alternately connect a working chamber to sources and sinks of high and low pressure fluid (or vice versa). Parks teaches an uncontrollable mechanically driven fluid commutator which is commonplace and well known in the present day. Jokela and Salter teach a different commutation mechanism, namely the controllable holding open of the inward-facing (i.e. opening towards the working chamber) check balls of a commonplace checkball pump, in conjunction with separate outward-facing check balls.

Although Applicant's device comprises a commutating mechanism 2 similar to what is taught by Parks, and an electrically operated check valve 1, which is a feature of both Salter and Jokela, that is where the similarity ends. The function and location of the check valve are different in the Applicant's device compared to Salter and Jokela.

Firstly, the electrically operated valve 1 is not a commutating valve because it does not switch a working chamber between high and low pressure, as Jokela or Salter's two check valves achieve together. Hence, it is not through the control of commutation that Applicant's device is controllable, as it is in Jokela and Salter's machines – Applicant controls the device through controlling of access to a commutated volume.

A person of ordinary skill wanting to commutate the machine of Parks with the controllable commutation as taught by Jokela or Salter, would simply end up replacing the commutator of Park's machine with (controllable) check valves to produce Jokela or Salter's machines. Secondly, the present machine has only one check valve (the controllable one) per working chamber, whereas Jokela and Salter both teach machines with two check valves per working chamber. Neither Jokela's nor Salter's machines could be made to work with just one check valve per working chamber nor do they provide any hint at how such an end could be achieved. This is because at least two check valves are needed to commutate a working chamber (one connecting to low pressure and one connecting to high pressure). The fact that Applicant's device works with only one check valve per working chamber highlights the inventive difference between them, and evidences that in Applicant's device the check valve is not a commutating valve because it connects the working chamber to either high or low pressure at different times. Thirdly, working chambers of the present machine are put into use by leaving the controllable valve open for an entire working chamber cycle (or

indefinitely). Neither Salter nor Jokela teach this method of operation because it does not work for those machines; the commutating valves of their working chambers must be opened and closed each and every cycle that the chambers are in use. The new method of operation is not discovered in any of Salter, Jokela and Parks. The above points show that the check valve in Applicant's device has a different purpose, quantity and operation to that found in the prior art.

Further, there are two notable differences. Firstly, none of the cited prior art documents disclose a valve, let alone a controllable check valve 1, between a commutating mechanism 2 and a working chamber 4. Parks' machine has no controllable valves whatsoever, while Salter's and Jokela's machines have no need for an additional controllable valve because the commutation mechanism is itself controllable. The series arrangement of valves recited in the present claims is not found anywhere in the cited prior art.

It is not true to say that Applicant's device puts Salter's valve in the flow path in the way taught by Jokela because Jokela teaches: 1) to use a controllable valve for commutation; and 2) that the controllable valve should be in the flow path at a point of constant inlet pressure. In contrast, the controllable valve in Applicant's device is: 1) not used for commutation; and 2) at a point in the flow path of cyclically-varying

pressure not constant pressure. Hence Jokela does not teach or suggest the position of the controllable valve in Applicant's device.

Secondly, Applicant's device comprises a pressure-varying volume 3 between the commutator mechanism 2 and the controllable check valve 1. The presence of this pressure-varying volume allows the controllable check valve to work in Applicant's device. Without the volume being commutated by the commutator mechanism, the check valve would not be able to open, which evidences the need for the volume. None of the prior art documents disclose this pressure-varying volume between a commutator mechanism and a controllable valve. The above points show that the inventor could not use Jokela's and/or Salter's disclosures to teach or suggest the solution provided by Applicant's device, because neither document alone nor in combination discloses a controllable valve between the working chamber and the commutator mechanism, a pressure-varying volume between the commutator mechanism and the controllable valve, nor the method of operation of the controllable valve in the present machine. Accordingly, Applicant contends that the combination of the above steps and the incorporation of them to produce a useful machine constitutes the application of inventive skill.

Furthermore, Applicant's device has the following desirable features that would have promoted its use much earlier than the date of invention, were it discoverable by a

person of ordinary skill. Neither of the controllable machines in the prior art (Jokela and Salter) are able to motor at all when electrical power fails. However, the present invention will act perfectly well as a motor when electrical power is removed (albiet with a fixed displacement), if the controllable valve defaults to open. This represents a new safety improvement that is not achieved simply by the combination of benefits available with the prior art. In both Jokela's and Salter's machines, application of a 'low pressure' side pressure higher than the 'high pressure' side pressure will result in the free flow of fluid through the machine, and cannot result in useful work. Unfortunately this is a common requirement in wheel driving applications, for example to provide a braking capability. With Applicant's device, however, such a reversal of connected pressures is possible and effective. This makes Applicant's device suitable for use in closed fluid circuits (which is the most common type of vehicle hydrostatic transmissions) whereas both of the prior art machines are only useful in open fluid circuits.

There is an additional advantage of Applicant's device when a single controllable valve becomes stuck open, which experience has shown is one of the most common failures. In Jokela and Salter's machines, if a controllable valve between the working chamber and the high pressure manifold sticks open, fluid can flow freely through the working chamber to the low pressure manifold without the operator or controller being aware of it. This free flow prevents a driving fluid working machine (pump) from raising

pressure in the high pressure manifold, and prevents the fluid working machine with the fault (motor) from developing any torque. Applicant's device does not have this problem, because there is no free flowing path when any of the controllable valves are left open. The failure mode of the new machine is simply that the displacement is slightly larger than expected. The difference is particularly important when one considers what would happen if the different machines were fitted in a vehicle and the vehicle is trying to slow down. When the failure is present, a machine as taught by Salter or Jokela wouldn't be able to slow down, if it wasn't also trying to close the low pressure valve on the particular working chamber with the problem (which it may not be because it probably cannot detect the problem).

In light of the foregoing, Applicant believes that this application is in form for allowance. The Examiner is encouraged to contact Applicant's undersigned attorney if the Examiner believes that issues remain regarding the allowability of this application.

Respectfully submitted,

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